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Three new species of *Stemphylium* from Sinkiang, China

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Abstract — Three new species of *Stemphylium* discovered from diseased leaves of *Ixeris denticulata*, *Brassica pekinensis,* and *Malus sieversii* in Sinkiang province of Northwest China, are described as *Stemphylium ixeridis*, *S. brassicicola,* and *S. microsporum*. They are compared to similar morphological species.

Key words — hyphomycetes, fungi, taxonomy

Introduction

Wallroth (1833) erected the genus *Stemphylium* based on the type species, *Stemphylium botryosum* Wallr. Wiltshire (1938) examined available type specimens of *Stemphylium* species and the descriptive literature fundamental to the current concepts of *Stemphylium*. Simmons (1967) delineated the genus, which shares several characters with *Alternaria* and *Ulocladium*, including muriform, usually pigmented conidia; it can be separated from *Alternaria* and *Ulocladium* by the following criteria (Simmons 1967): (i) The percurrently proliferating conidiophore is the principal morphological characteristic of *Stemphylium* and (ii) the apical cell of a simple *Stemphylium* conidiophore is slightly to distinctly swollen. There are 33 published names that represent recognizable taxa of *Stemphylium* (Câmara et al. 2002). The taxonomic classification of *Stemphylium* is primarily based on the morphological characteristics of conidia including variation in conidial shape, size, length/width ratio, color, septation, and ornamentation, and length of the conidiophore and diameter of the terminal, swollen apical cell of the conidiophore (Simmons 1967, 1969, 1990, 2001, 2002, 2004; Weber 1930; Yamamoto 1960). In recent years numerous *Stemphylium* spp. were isolated from leaf spots of different plants in China. Among them are three new species from necrotic leaf spots on *Ixeris denticulata*, *Brassica pekinensis* and *Malus sieversii* in Sinkiang province, China. They are illustrated and described and compared morphologically to similar species.

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Materials and methods

The specimens were collected from black spots on living leaves of plants during 2008–09. Fungi were isolated by moistening the leaves, then picking single conidia growing from the tissues in Petri dishes. Those isolates were cultured on PDA (potato-dextrose agar) at 23°C and transferred to PCA (potato-carrot agar) after 3–5 days. Morphological descriptions of *Stemphylium* spp. were based on cultures that developed under standardized conditions (Simmons & Roberts 1993): potato-carrot agar (PCA) at ambient room temperature 23°C, under a daily fluorescent light/dark cycle of 8/16 h, and examined after 2–3 weeks. All microscopic characteristics were determined on the basis of measurements of 50 mature conidia and 30 conidiophores mounted in lactic acid at 100 × magnification.

Taxonomic descriptions

Stemphylium ixeridis Y.F. Pei & X.G. Zhang, **sp. nov.** FIGURE 1

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Ex culturis in agaro 'potato-carrot' descripta. Coloniae effusae, pallide brunneae. Mycelium superficiale, hyphae ramosae, septatae, pallide brunneae, laeves, 3.5–4.5 µm latae. Conidiophora solitaria, nonramosa vel raro ramosa, pallide brunnea, laevia, cylindrica, 16–22-septata, 685–765 × 3.5–5.5 µm. Apex conidiogenus, brunneus, usque 7.5–9.0 µm dilatatus, dense guttulatus, semel proliferens. Conidia singula in apice conidiophori, subsphaerica, ovoidea vel late ellipsoidea, sursum rotundata, deorsum rotundata vel subtruncata, 1–2(–3) septis transversalibus et 0–2 septis longitudinalibus vel obliquis divisa, in medio distincte constricta, 30–45 × 18–26 µm, medio-brunnea vel atro-brunnea, dense verrucosa.

Holotype: on leaves of *Ixeris denticulata* (Houtt.) Stebbins (*Asteraceae*), a kaleyard of Korla, Sinkiang province, Northwestern China. Aug. 6. 2009, Y.F. Pei, HSAUPpyf1837, the ex-type culture is preserved in the Centraalbureau voor Schimmelcultures (CBS), No. CBS 124748.

Etymology: in reference to the host genus, *Ixeris*.

Colonies on PCA effuse, pale brown. Mycelium superficial, hyphae branched, septate, pale brown, smooth, 3.5–4.5 µm wide. Conidiophores solitary, unbranched or occasionally branched, pale brown, smooth, cylindrical, 16–22-septate, 685–765 × 3.5–5.5 µm (Fig. 1A–B). Conidiogenous cells swollen at the apex, brown, 7.5–9.0 µm wide, densely guttulate, occasionally with 1 apical proliferation (Fig. 1B–C). Conidia developing singly, subspherical, ovoid or broadly ellipsoidal, rounded at the apex, rounded or subtruncate at the base, with 1–2(–3) transverse septa and 0–2 longitudinal or oblique septa, usually distinctly constricted at the median transverse septum, 30–45 × 18–26 (av. 36.5 × 23.5) µm, L/W = 1.3–2.1 (av. 1.6), medium brown to dark brown, densely verrucose (Fig. 1B–D).

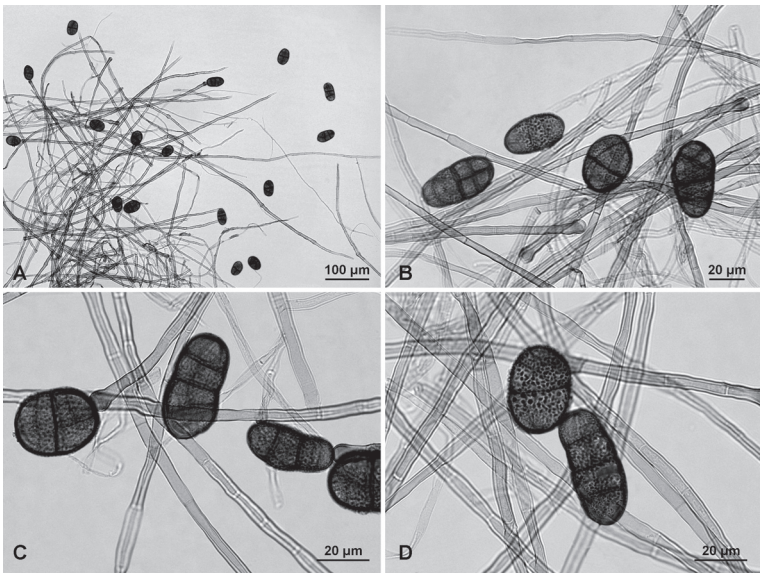

Fig. 1. *Stemphylium ixeridis*. A–C. Characteristics of mature conidia and conidiophores. D. Ornamentation of mature conidia.

The conidia of *S. ixeridis* are similar in shape to those of *S. pruni* (Wang & Zhang 2006) and *S. pyrinum* (Wang et al. 2009) (Table 1), but the L/W ratio is smaller. Conidia of *S. ixeridis* are usually distinctly constricted at the median transverse septum, while *S. pruni* and *S. pyrinum* are distinctly constricted at 1–2 and 1–3 transverse septa, respectively. The conidiophores of *S. ixeridis* (685–765 µm) are longer than those of *S. pruni* (87–134 µm) and *S. pyrinum* (56–110 µm). The conidial ornamentation of *S. ixeridis* is also different to that of *S. pruni* and *S. pyrinum*.

Stemphylium brassicicola Y.F. Pei & X.G. Zhang, **sp. nov.** figure 2

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Ex culturis in agaro 'potato-carrot' descripta. Coloniae effusae, pallide brunneae vel medio-brunneae. Mycelium superficiale, hyphae ramosae, septatae, pallide brunneae, laeves, 3.5–4.5 µm latae. Conidiophora solitaria, ramosa vel nonramosa, pallide brunnea, laevia, cylindrica, 3–6-septata, 58–149 × 3.5–4.5 µm. Apex conidiogenus, medio-brunneus, usque 5.5–7.5 µm dilatatus, dense guttulatus, semel vel bis proliferens. Conidia singula in apice conidiophori, subdoliiformia, cylindrica vel oblonga cylindrica, sursum rotundata vel subtruncata, deorsum subtruncata, 1–4(–5) septis transversalibus et 3–5(–6) septis longitudinalibus vel obliquis divisa, 1–2(–3) distincte constricta, 32–45 × 12–19 µm, medio-brunnea vel brunnea, conspicue punctulata vel punctata.

Holotype: on leaves of *Brassica pekinensis* (Lour.) Rupr. (*Brassicaceae*), pear orchards of Korla, Sinkiang province, Northwestern China. Aug. 7. 2009, Y.F. Pei,

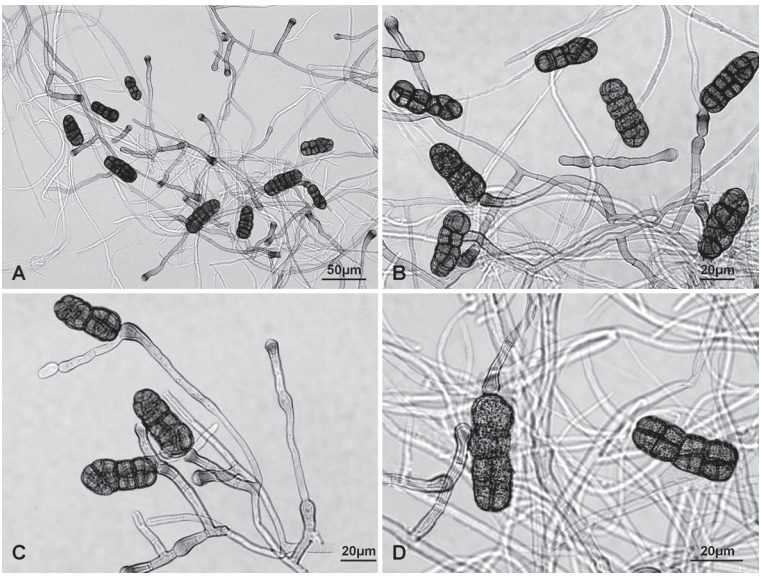

Fig. 2. *Stemphylium brassicicola*. A–C. Characteristics of mature conidia and conidiophores. D. Ornamentation of mature conidia.

HSAUPpyf1858(2), the ex-type culture is preserved in the Centraalbureau voor Schimmelcultures (CBS), No. CBS 124749.

Etymology: in reference to the host genus, *Brassica*.

Colonies on PCA spreading, pale brown to medium brown, cottony. Mycelium superficial, hyphae branched, septate, pale brown, smooth, 3.5–4.5 μm wide. Conidiophores solitary, branched or unbranched, pale brown, smooth, cylindrical, 3–6-septate, 60–150× 3.5–4.5 μm (Fig. 2A–C). Conidiogenous cells swollen at the apex, medium brown, 5.5–7.5 μm wide, densely guttulate, occasionally with 1–2 apical proliferations (Fig. 2B–C). Conidia developing singly, subdoliiform, cylindrical to oblong cylindrical, rounded or subtruncate at the apex, subtruncate at the base, with 1–4(–5) transverse septa and 3–5(–6) longitudinal or oblique septa, distinctly constricted at 1–2(–3) of the transverse septa, 32–45 × 12–19 (av. 36.5 × 15.0) μm, L/W = 2.0–3.1 (av. 2.4), medium brown to brown, conspicuously punctulate to punctate (Fig. 2B–D).

S. brassicicola morphologically resembles *S. bubakii* (Simmons 2002) and *S. trisectum* (Simmons 2002) (Table 1). However, the conidia of *S. brassicicola* are smaller with 1–2(–3) distinctly constricted transverse septa, whereas *S. bubakii* and *S. trisectum* have 8–10 and 3 distinctly constricted transverse septa, respectively. Conidia of *S. bubakii* and *S. trisectum* are verrucose whereas those of *S. brassicicola* are punctulate to punctate.

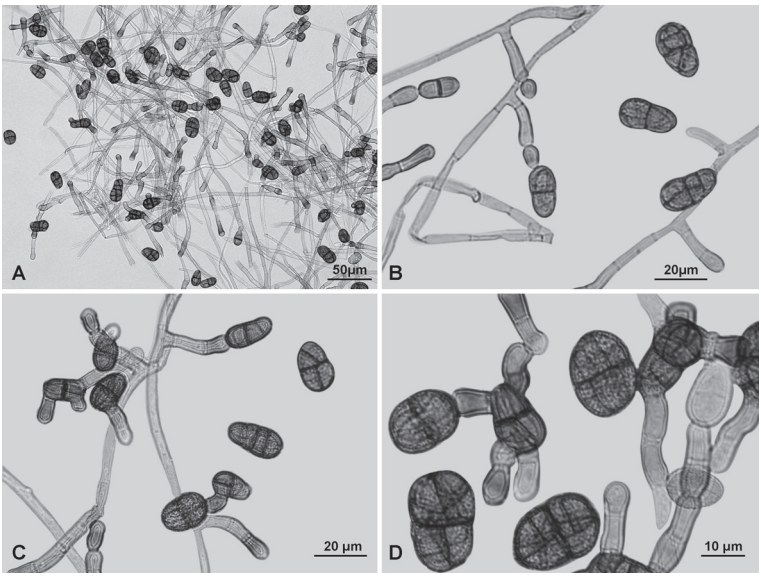

Fig. 3. *Stemphylium microsporum*. A–C. Characteristics of mature conidia and conidiophores. D. Ornamentation of mature conidia.

Stemphylium microsporum Y.F. Pei & X.G. Zhang, **sp. nov.** FIGURE 3

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Ex culturis in agaro 'potato-carrot' descripta. Coloniae effusae, pallide brunneae vel medio-brunneae. Mycelium superficiale, hyphae ramosae, septatae, pallide brunneae, laeves, 3.5–4.5 µm latae. Conidiophora solitaria, nonramosa vel raro ramosa, pallide brunnea, laevia, cylindrica, 1–3-septata, 37–65 × 3.5–5.5 µm. Apex conidiogenus, brunneus, usque 5.5–6.5 µm dilatatus, laevis, semel vel bis proliferens. Conidia singula in apice conidiophori, ovoidea vel oblonga ellipsoidea, sursum subtruncata, deorsum rotundata vel subtruncata, 1–2 septis transversalibus et 1–3 septis longitudinalibus vel obliquis divisa, in medio distincte constricta, 15–24 × 9–15 µm, medio-brunnea vel brunnea, pustulata.

Holotype: on leaves of *Malus sieversii* (Ledeb.) M. Roem. (*Rosaceae*), apple orchards of Yili, Sinkiang province, Northwestern China. Aug. 10. 2009, Y.F. Pei, HSAUPpyf1904, the ex-type culture is preserved in the Centraalbureau voor Schimmelcultures (CBS), No. CBS 124753.

Etymology: in reference to the small conidia.

Colonies on PCA spreading, pale brown to medium brown. Mycelium superficial, hyphae branched, septate, pale brown, smooth, 3.5–4.5 µm wide. Conidiophores solitary, unbranched or occasionally branched, pale brown, smooth, cylindrical, 1–3-septate, 37–65 × 3.5–5.5 µm (Fig. 3A–C). Conidiogenous cells swollen at the apex, brown, 5.5–6.5 µm wide, smooth, occasionally with 1–2 apical proliferations (Fig. 3B–D). Conidia developing

Table 1. Comparison of conidial characters of *Stemphylium ixeridis*, *S. brassicicola*, *S. microsporum*, and similar *Stemphylium* species

Character	*S. ixeridis*	*S. pruni*	*S. pyrinum*	*S. brassicicola*	*S. bubakii*	*S. trisectum*	*S. microsporum*	*S. subglobuliferum*
Shape	Subspherical, ovoid, or broadly ellipsoidal	Oblong ellipsoidal or oblong	Cylindrical, ellipsoidal or oblong	Subdoliiform, cylindrical to oblong cylindrical	Broadly ovoid, broadly ellipsoidal or oblong cylindrical	Oblong	Ovoid or oblong ellipsoidal	Oblong ellipsoidal or ellipsoidal
Size (µm) (mean)	30–45 × 18–26 (36.5 × 23.5)	17–44 × 11.5–24	36–48 × 14–18 (44.1 × 15.8)	32–45 × 12–19 (36.5 × 15.0)	50–70 × 24–32	48–77 × 16–23	15–24 × 9–15 (20.0 × 12.0)	8.0–19.0 × 5.0–13.0
Transverse septa	1–2(–3)	1–3	(1–)2–3	1–4(–5)	8–10		1–2	1
Longitudinal/ oblique septa	0–2	0–1	0–2	3–5(–6)	1–4		1–3	occasionally 1
Length/width ratio	1.3–2.1 (av. 1.6)	1.5–2.4 (av. 1.9)	2.0–2.8	2.0–3.1 (av. 2.4)			1.3–2.0 (av. 1.7)	1.0–2.5
Wall	Densely verrucose	Smooth	Densely tuberculate	Conspicuously punctulate to punctate	Verruculose	Verruculose	Pustulate	Smooth

singly, ovoid or oblong ellipsoidal, rounded at the apex, rounded or subtruncate at the base, with 1–2 transverse septa and 1–3 longitudinal or oblique septa, usually distinctly constricted at the median transverse septum, 15–24 × 9–15 (av. 20.0 × 12.0) μm, L/W = 1.3–2.0 (av. 1.7), medium brown to brown, pustulate (Fig. 3B–D).

The shape of conidia of *S. microsporum* and *S. subglobuliferum* (Xue et al. 2005) are similar (Table 1), but *S. microsporum* has larger conidia. Conidia of *S. microsporum* have more transverse and longitudinal or oblique septa than those of *S. subglobuliferum*. *S. microsporum* also differs from *S. subglobuliferum* by the ornamentation of conidial walls.

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